

REMARKS

Claims 1-21 are pending in this application. By this Amendment, claims 3, 5, 11 and 12 are amended, as is the Specification. Figs. 1, 8, 10 and 11 are replaced with corrected sheets. Claims 13-21 have been provisionally withdrawn from consideration. Reconsideration based on the above amendments and the following Remarks is respectfully requested.

The Office Action, in paragraph 2, objects to the drawings for a number of errors. Figs. 1, 8, 10 and 11 are replaced with the attached replacement drawing sheets. Specifically, Fig. 10 is corrected to identify the filter with reference number 297, not 298. With regard to reference in the Specification of reference characters 184, 192 both being used to designate suction nozzles, the Specification (para. [0054]) is amended to change suction "nozzle" 192 to suction "pipe" 192. Additionally, Fig. 1 is amended to correct what reference numbers 266, 290 properly represent (they were traversed), Fig. 8 is amended to remove one instance of duplicate reference numbers 100, and Fig. 11 is corrected to change one of duplicate reference numbers 284 to reference number 274. Reconsideration and withdrawal of the objections to the drawings are respectfully requested.

The Office Action, in paragraph 3, objects to the Specification for certain informalities. The Specification is amended to obviate the objection. Further amendments to the Specification are made to correct typographical errors. These amendments introduce no new matter. Reconsideration and withdrawal of the objection to the Specification are respectfully requested.

The Office Action, in paragraph 4, objects to the title of the invention as not descriptive. The title is amended in accordance with the Examiner's helpful suggestion in the Office Action. Reconsideration and withdrawal of the objection to the title are respectfully requested.

The Office Action, in paragraph 6, rejects claims 11 and 12 under 35 U.S.C. §112, second paragraph, as being indefinite. Claims 11 and 12 are amended to obviate the rejection. Reconsideration and withdrawal of the rejection to claims 11 and 12 under 35 U.S.C. §112, second paragraph, are respectfully requested.

The Office Action, in paragraph 13, indicates that claims 7-10 contain allowable subject matter. Applicants appreciate this indication of allowability but submit that independent claim 5, from which claims 7-10 indirectly depend, is allowable for the reasons discussed below.

The Office Action, in paragraph 8, rejects claim 1 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,878,484 to Araya et al. (hereinafter "Araya"). This rejection is respectfully traversed.

Araya shows, in Fig. 4, a chip mounting apparatus including a chip suction nozzle 38 with a nozzle cap 68, and a chip observing camera 42 for taking an image of a chip 90 held by the suction nozzle 38. See also Fig. 11. Araya states that the positional deviation of the chip from a center of the nozzle cap can be detected because it is possible to previously know a positional relationship between the chip observing camera and the center of the nozzle cap. The positional deviation includes deviation of chip in the X-Y directions and deviation in a rotation direction of the chip (col. 10, lines 32-38). Thus, the apparatus disclosed in Araya assumes that the positional relationship between the chip observing camera and the center of the nozzle cap is known in advance. Additionally, the "center" of the nozzle cap may not mean the "rotation" axis of the suction nozzle.

Finally, Araya neither teaches nor suggests detecting the position of the center (or rotation axis) of the suction nozzle 38 on the position-detecting plane including a component-mounting surface (Reference No. 62 in Fig. 4) of a printed circuit board. Again, with reference to Fig. 4 of Araya, the chip observing camera 42 takes an image of the chip 90 at a

high position above, and distant from, the component-mounting surface 62 of the printed circuit board. Therefore, when the suction nozzle 38 holding the chip 90 is lowered from the high position to the component-mounting surface 62, the position of the center (or rotation axis) of the suction nozzle 38 relative to the chip observing camera 42 may have deviated from the previously known positional relationship between the center of the nozzle cap 68 and the chip observing camera 42.

Claim 1 recites, among other features, detecting, on a position-detecting plane including the component-mounting surface of the circuit substrate, the position of the rotation axis of the suction nozzle. Applicants respectfully submit that Araya fails to teach or suggest actually detecting a position of a rotation axis of the suction nozzle on a position-detecting plane including the component-mounting surface of the circuit substrate. Reconsideration and withdrawal of the rejection to claim 1 under 35 U.S.C. §102(b) as being anticipated by Araya are respectfully requested.

The Office Action, in paragraph 10, rejects claim 1-6 and 11 under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,438,425 B1 to Kawada. This rejection is respectfully traversed.

Kawada teaches a method for measuring an accuracy with which an electronic component mounting system mounts one or more electric components on a circuit substrate (Abstract). Kawada teaches a method of detecting a first relative position between a component camera 68 and a rotation axis of a suction nozzle 62, and a relative position between a fiducial-mark camera 66 and the rotation axis of the suction nozzle 62. The first relative position is detected by rotating the suction nozzle 62 holding a standard chip 100, to different angular positions and taking, with the component camera 68, perspective images of the chip 100 held by the suction nozzle 62 at those regular angular positions, as shown in Fig. 4. As is apparent from Figs. 1 and 4, the first relative position is detected at a high position

above, and distant from, a component mounting surface 16 of a printed wiring board. Note the positions of the cameras 66 and 68 above the prism 72 in Fig. 1.

The second relative position between the fiducial-mark camera 66 and the rotation axis of the suction nozzle 62 is detected by placing the standard chip 100 on a chip-place position 102, shown in Fig. 1, and taking with the fiducial-mark camera 66, an image of the standard chip 100 placed on the chip-place position 102 (col. 24, lines 21-41). When the suction nozzle 62 holding the chip 100 is lowered from the high position where the first relative position between the component camera 68 and the rotation axis of the suction nozzle 62 was detected, to a lower position where the chip-place position 102 is provided, the position of the rotation axis of the suction nozzle 62 relative to the component camera 68 may have deviated from the actually detected first relative position, in like manner to the apparatus disclosed in Araya. Kawada's method assumes that the first relative position detected at the high position distant from the component mounting surface 16 of the printed wiring board does not change when the suction nozzle 62 holding the chip 100 is lowered from the high position to the component-mounting surface 16.

Because the first relative position may change, Applicants' method, according to claim 1, involves actually detecting, on the position-detecting plane including the component-mounting surface, the position of the rotation axis of the suction nozzle, or according to claim 5, preparing a calibration member having, substantially on the position-detecting plane, a support surface and at least one first positioning reference, and placing, on the support surface, a calibration gauge having at least one second positioning reference.

In particular, regarding claim 5, Kawada teaches placing, with the suction nozzle 62, the standard chip 100 on the chip-place position 102 and taking, with the fiducial-mark camera 66, a first image of the standard chip 100 placed on the chip-place position 102. Kawada does not teach or suggest moving, with the suction nozzle, the standard chip 100

away from the chip-place position 102, rotating the suction nozzle 62 holding the chip 100 by a predetermining angle, replacing the chip 100 on the chip-placed position 102, taking a second image of the chip 100 placed on the chip-placed position 102, or processing the thus obtained two images to determine a relative position between the chip 100 and a rotation axis of the suction nozzle 62.

Applicants respectfully submit that, based on the above, Kawada neither anticipates nor suggests the subject matter of independent claims 1 and 5. Further, Applicants respectfully submit that dependent claims 2-4, 6 and 11 contain all of the features of independent claims 1 and 5 from which they respectively depend. As such, Kawada neither anticipates nor suggests the subject matter of dependent claims 2-4, 6 and 11.

Reconsideration and withdrawal of the rejections to claims 1-6 and 11 under 35 U.S.C. §102(e) as being anticipated by Kawada are respectfully requested.

The Office Action, in paragraph 12, rejects claim 12 under 35 U.S.C. §103(a) as being unpatentable over Kawada. This rejection is respectfully traversed.

Applicants respectfully submit that dependent claim 12 contains all of the features of independent claim 5 from which it depends. As such, Kawada neither anticipates nor suggests the subject matter of dependent claim 12.

Additionally, this application and the patent to Kawada were, at the time the invention this application was made, owned by, or subject to an obligation of assignment to, a common assignee. As such, Kawada is unavailable as a reference under 35 U.S.C. §103.

Reconsideration and withdrawal of the rejection to claim 12 under 35 U.S.C. §103(a) as being unpatentable over Kawada are respectfully requested.

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1-6 and 11-12, in addition to the allowable subject matter of claims 7-10, are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned representative at the telephone number set forth below.

Respectfully submitted,



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Attachments:

Replacement sheets with Figures 1, 8, 9, 10, 11 and 12

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